REMARKS

Reconsideration of the present application is respectfully requested. Applicant has amended the claims to address the objections raised by the Examiner. Applicant respectfully submits that the amendments do not introduce new matter into the application. Applicant's arguments directed to the Examiner's rejections and objections are presented in the Discussion that follows. Before turning to the Applicant's arguments, a brief summary of the Office Action may prove helpful.

Summary of the Office Action

In the Office Action, which the Examiner denotes as non-final, the Examiner has rejected all claims, claims 1-12, and has raised an objection to the drawings.

1. Drawings

The Examiner has objected the drawings under 37 CFR 1.83(a). The Examiner states that the drawings must show every feature of the invention specified in the claims and thus the at least one light source, the at least one sample cell, and the means for reading the pixels in claim 1 must be shown or the feature(s) canceled from the claim(s).

2. Claim Rejections – 35 USC § 102(b)

The Examiner has rejected claims 1-11 under 35 U.S.C. 102(b) as being anticipated by Yadid-Pecht (USPN 6,175,383 B1).

3. Claim Rejections – 35 USC § 102(e)

The Examiner has rejected claims 12 under 35 U.S.C. 102(e) as being anticipated by Deng et al. (USPN 6,765,619 B1).

Applicant will address each of the Examiner's objections and rejections in the Discussion that follows.

Discussion

1. Drawings

The Examiner has objected to the drawings under 37 CFR 1.83(a). The Examiner contends that the drawings must show every feature of the invention specified in the claims and thus the at least one light source, the at least one sample cell and the means for reading pixels in claim 1 must be shown or the features cancelled from the claims.

Reconsideration of the Examiner's objections in this regard is respectfully requested. Applicant respectfully suggests that the Examiner's quotation from the CFR is incomplete and misleading. Sections 1.83(a) and 1.83(b) (in pertinent part) read as set forth below:

"(a) The drawing in a nonprovisional application must show every feature of the invention specified in the claims. However, conventional features disclosed in the description and claims, where their detailed illustration is not essential for a proper understanding of the invention should be illustrated in a drawing in the form of a graphical drawing symbol or a labeled representation (e.g., a labeled rectangular box). …

(b) When the invention consists of an improvement on an old machine the drawing must when possible exhibit, in one or more views, the improved portion itself, disconnected from the old structure, and also in another view, so much of the old structure as will suffice to show the connection of the invention therewith."

The present drawings, as filed, clearly comport with 37 CFR 1.83(a) and (b) and more importantly, 35 USC Section 112. The drawings are focused on the self scanning features of the photo diodes. The Examiner clearly has not considered the directive of 37 CFR 1.83(a) in its complete form and certainly not in view of the very next subparagraph (b).

The features of a sample cell are conventional and do not need to be illustrated under section 1.83(b). Individuals skilled in the art understand how the improved portion of the present invention relates to the old structures. The Examiner has expressed no confusion in this regard.

A light source is well understood in the art of photodiodes. A depiction of a light source in any of the figures would not add to an understanding of the invention of the claims.

Applicant further maintains that the light source and sample cell are depicted in the Figures. For example, Figure 2 depicts the saturation levels of the pixels from a light source. Figure 4 depicts in block form the measurement of a reference spectrum which is performed with a sample cell.

The means for reading the pixels recited in claim 1 comprises switching the charge accumulated in each pixel at the appropriate time to an output video line for A/D conversion and then passing the converted or digital data to a data system, which is also well known by those skilled in the art, and is expressed as well in the prior art references cited by the Examiner. The difference between the prior art and the present invention is that prior art devices initiate the read process after an exposure time, say, t_0 while the claimed device allows low signal pixels to accumulate charge for multiples of the exposure time t_0 before being read, as recited in the second means clause of claim 1 of the present application. The Applicant respectfully submits that the drawings need not depict every detail that is prior knowledge and known by those skilled in the art.

Applicant respectfully submits the present claims pass muster under 37 CFR 1.83(a) and (b) and more importantly 35 USC Section 112. Applicant respectfully request withdrawal of all objections to the drawings.

2. Claim Rejections – 35 USC § 102(b)

The Examiner has rejected claims 1-11 under 35 U.S.C. 102(b) as being anticipated by Yadid-Pecht (USPN 6,175,383 B1). The Examiner asserts that Yadid-Pecht et al. discloses a self-scanned photodiode array that has all the elements and features as claimed in the claims 1-11 of the present application.

Applicant respectfully disagrees. Applicant respectfully submits that the key elements that characterize the present invention, as disclosed in independent claim 1 and in claims 2-11 which depend from claim 1, are not found nor described in Yadid-Pecht's patent. Yadid-Pecht does not disclose, suggests or teach means for skipping the reading of selected pixels as recited in claim 1.

First, Yadid-Pecht's device is based on an active pixel sensor (APS) which has amplifier and readout circuitry as part of every pixel, while the pixels of the self-scanned photodiode array of the present invention contain no signal conditioning circuitry; they simply accumulate charge in response to light. The present invention discloses how the charge from each pixel is switched at the appropriate time to the output video line for A/D conversion and input to the data system, in such a way as to maximize the signal-to-noise ratio of data from every pixel. Yadid-Pecht has no appreciation or disclosure that relates to scanning pixels and skipping selected pixels to maximize the signal-to-noise ratio of each and every pixel.

Second, Yadid-Pecht's device is intended to improve the dynamic range of a sensor array for capturing a two dimensional image and is not intended to

improve the signal-to noise ratio of the data measured by individual pixels. In fact, it reduces the signal-to noise ratio of bright pixels to match that of dim pixels. The purpose of the present invention is to improve or maximize the signal-to-noise of all pixels within the constraints set by the light intensity falling on each pixel.

Third, in Yadid-Pecht's invention, all pixels are read the same number of times. Bright pixels are read for a shorter time than dim pixels. Data are discarded from bright pixels during part of each read cycle to prevent saturation. This results in reduced signal-to-noise for bright pixels compared with what it would have been had the full exposure time been utilized for measurement of image data. In the present invention, the bright pixels of the device are read multiple times within a sample period, which avoids saturation but also through signal averaging improves signal-to-noise, and the dim pixels are read fewer times per sample period so that charge can be accumulated close to their full-well capacity. The claimed device allows low signal pixels to be exposed for specified integer multiples (M) of a predetermined exposure time t_0 before being read. This maximizes the signal-to-noise ratio of data from dim pixels because the read noise, which is added each time a pixel is read, is minimized when the number of reads is minimized.

Further, Yadid-Pecht does not disclose, suggest or teach means for skipping the reading of selected pixels for one or more additional exposure times allowing selected pixels to be exposed for specified integer multiples (M) of a predetermined exposure time t_0, thereby allowing said selected pixels receiving less light to accumulate additional charge before being read out and thereby reducing the number of read cycles and improving the signal-to-noise ratio. Yadid-Pecht does not disclose, suggest or teach pixel exposure times Mt_0 to be sub-multiples of a sample time.

"A claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference." *Verdegaal Bros. v. Union Oil Co. of California*, 814 F.2d 628, 631, 2 USPQ2d 1051, 1053 (Fed. Cir. 1987).

Applicant respectfully submits that the present inventions as recited in claims 1-11 are novel and distinguishable over Yadid-Pecht.

3. Claim Rejections – 35 USC § 102(e)

The Examiner has rejected claim 12 under 35 U.S.C. 102(e) as being anticipated by Deng et al. (USPN 6,765,619 B1). The Examiner asserts that Deng et al. discloses a method of improving signal to noise ratio of measurements made using a self-scanned photodiode array to detect light in the UV-VIS-IR portions of a light spectrum comprises essentially all the elements as recited in the claim 12 of the present application.

Applicant respectfully disagrees. Applicant respectfully submits that the key elements that characterize the present invention, as disclosed in independent claim 12 are not found nor described in Deng's patent.

Applicant's comments with respect to the Yadid-Pecht reference, as applied to claims 1-11, apply equally here with respect to Deng's method. The method of the present invention maximizes signal-to-noise of data from all pixels no matter what the intensity of light falling on them. Each array exposure time, referred to as the sample period in the present invention, is fully used to collect and average data from every pixel. The bright pixels of the device are read multiple times during each sample period, which avoids saturation but also improves signal-to-noise, and the dim pixels are read fewer times per sample period so that charge can be accumulated close to their full-well capacity. The claimed method allows low signal pixels to be exposed for specified integer multiples (M) of a

predetermined exposure time t_0 before being read. This maximizes the signal-to-noise ratio of data from dim pixels because the read noise, which is added each time a pixel is read, is minimized when the number of reads is minimized.

The pixels of a linear, self-scanned photodiode array of the present invention contain no circuitry. They simply accumulate charge in response to light. The present invention discloses how the charge from each pixel is shifted at the appropriate time to the output video line for A/D conversion and input to the data system, in such a way as to maximize the signal-to-noise ratio of data from every pixel.

Contrary to the present invention, Deng's method is a means to avoid saturation of bright pixels in the image while still having an image exposure time long enough to record data from dim pixels. Deng discloses a two dimensional image array with active pixels, each of which can sense light and contains circuitry to output a digital signal. The digital signal from each pixel can be sampled during the exposure period and the time needed to reach saturation is recorded. Once a pixel has received sufficient light to reach the saturation limit, no more data from that pixel are recorded for the remainder of the image exposure time. Since the full exposure time is not utilized for any but the dimmest pixels, the signal-to-noise ratio of Deng's method is reduced for pixels receiving more light.

Deng does not disclose, suggests or teach means for skipping the reading of selected pixels for one or more additional exposure times allowing selected pixels to be exposed for specified integer multiples (M) of a predetermined exposure time t_0, thereby allowing said selected pixels receiving less light to accumulate additional charge before being read out and thereby reducing the number of read cycles and improving the signal-to-noise ratio.

Applicant respectfully submits that the present inventions as recited in claims 12 is novel and distinguishable over Deng.

4. New claim 13

Applicant has introduced new claim 13 which is devoted more specifically to a self-scanned photodiode array without a light source and a sample cell. The device of claim 13 is novel and nonobvious over the prior art as set forth with respect to claims 1-12.

Applicant respectfully submits that all claims are free of prior art.

Conclusion

Applicant respectfully submits the present Application is in condition for allowance which action is earnestly solicited.

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Respectfully submitted

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